

REMARKS

Applicants acknowledge, with appreciation, the telephone interview granted to Applicants' representative on February 25, 2003.

In one embodiment, the present application relates to a motor including a pipe (or a sintered bearing) that is press-fitted and disposed within a frame at a fitted section of the frame. Because the pipe (or the sintered bearing) is press-fitted within the frame, the outer diameter of the pipe is larger than the inner diameter of the frame at the fitted section of the frame. After being press-fitted into the frame, the pipe (or the sintered bearing) is welded to the frame at the fitted section.

Claims 3, 7, 11, and 15 have been cancelled. Claims 1-2, 4-6, 8-10, 12-14, and 16 are pending.

Claims 1-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ibata et al. (JP 10-217272) in view of Koyama (JP 08-067449) and Obara (U.S. Patent No. 6,420,809 B1). Claims 5-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koyama in view of Obara. Claims 9-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ibata in view of Koyama, Obara, and Okuyama (U.S. Patent No. 5,798,588). Claims 13-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koyama in view of Obara and Okuyama.

It is respectfully submitted, however, that the claims, as amended, are patentable over the art of record for reasons set forth below.

Ibata discloses a slender cylindrical coreless motor including a pipe 2 with one end fixed to frame 1 (see Abstract). Koyama discloses a motor having a coreless rotor 2 which includes a cylindrical housing 11, where a bearing housing 12 is attached at the inside of cylindrical housing 11 (see Abstract). Koyama also discloses a magnet 17 attached to the outer circumference of bearing housing 12 (see Abstract). Obara discloses a bearing structure for a flat motor wherein the outer race or inner race of the bearing structure includes a single row ball bearing and a cylindrical bearing (see Abstract). Okuyama discloses a vibrating motor including an eccentric weight attached to an end of a shaft projecting from the motor housing (see Abstract).

Applicants' invention, as recited by claim 1 includes a feature which is neither disclosed nor suggested by the art of record, namely:

a pipe fitted in and disposed within ... a fitted section of the frame, an outer diameter of the pipe being larger than an inner diameter of the frame at the fitted section, the difference between the inner diameter of the frame at the fitted section and an outer diameter of the pipe being between 0 μm and 20 μm ... wherein said frame and said pipe are welded at the fitted section.

This means that the motor recited in claim 1 includes a pipe fitted in and disposed within a fitted section of a cylindrical frame of the motor. At the fitted section, the outer diameter of the pipe is larger than an inner diameter of the frame. More specifically, the amount by which the outer diameter of the pipe is larger than the inner diameter of the frame at the fitted section is between 0 μm and 20 μm . The pipe and the frame are welded at the fitted section. These features are found in the originally filed application at, for example, page 3, lines 12-23; page 5, lines 19-24; and Figure 1. No new matter has been added.

None of the references cited (Ibata, Koyama, Obara, and Okuyama) disclose or suggest these features. Ibata does disclose a pipe 2 concentrically disposed within a frame 1; however, Ibata includes no disclosure of an outer diameter of the pipe being larger than an inner diameter of the frame at a fitted section therebetween. Nor does Ibata disclose a difference between the inner diameter of the frame at the fitted section and an outer diameter of the pipe being between 0 μm and 20 μm .

It is because Applicants' include the above-recited features, that the following advantages are achieved. With the difference between the inner diameter of the frame at the fitted section and an outer diameter of the pipe being between 0 μm and 20 μm , a reduced amount of force is required to press-fit the pipe into the frame. By welding the pipe to the frame, adequate coupling strength is obtained, without undue force being applied in the press-fitting of the pipe into the frame. Because the press-fitting force is reduced, variation in the inner diameter of the pipe are reduced.

In the embodiment of the present application where the sintered bearing is press-fitted into the frame (e.g., as in claims 5 and 13), the reduced press-fitting force results in reduced variation in the inner diameter of the sintered bearing. This reduced variation in the inner diameter of the sintered bearing results in a more efficient number of revolutions of the motor, for example, because the sintered bearing affects vibration of a vibration type motor.

Additionally, these features result in improved holding strength between the pipe (or the sintered bearing) and the frame, as well as improved shock resistance of the motor structure.

Accordingly, for the reasons set forth above, claim 1 is patentable over the art of record. Claims 5, 9, and 13, while not identical to claim 1, include features similar to those recited above with respect to claim 1. Accordingly, independent claims 5, 9, and 13 are also patentable over the art of record for the reasons set forth above. Dependent claims 2, 4, 6, 8, 10, 12, 14, and 16 include all of the features of their respective independent claims (claim 1, 5, 9, or 13) from which they depend, either directly or indirectly. Thus, claims 2, 4, 6, 8, 10, 12, 14, and 16 are also patentable over the art of record for the reasons set forth above.

In view of the amendments and arguments set forth above, the above-identified application is in condition for allowance which action is respectfully requested.

Respectfully Submitted,

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Enclosure: Version with markings to show changes made

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April 16, 2003

VERSION WITH MARKINGS TO SHOW CHANGES MADE**IN THE CLAIMS:**

1. (Amended) A motor comprising:

(a) a cylindrical frame made of ferromagnetic material;

(b) a pipe fitted in and disposed within said frame concentrically at a fitted section of the frame, an outer diameter of the pipe being larger than an inner diameter of the frame at the fitted section, the difference between ~~an~~ the inner diameter of the frame at the fitted section and an outer diameter of the pipe is being between 0 μm and 20 μm ;

(c) a sintered bearing press-fitted into said pipe;

(d) a cylindrical magnet fixed on an outer wall of said pipe at an inner wall of said magnet; and

(e) a cylindrical coil facing said magnet via an annular space,

wherein said frame and said pipe are welded at ~~a~~ the fitted section therebetween.

5. (Amended) A motor comprising:

(a) a cylindrical frame made of ferromagnetic material;

(b) ~~a pipe fitted in and disposed within said frame concentrically, the difference between an inner diameter of the frame and an outer diameter of the pipe is between 0 μm and 20 μm ;~~

(~~e~~) a sintered bearing fitted in and disposed within said frame concentrically at a fitted section of the frame, an outer diameter of the sintered bearing being larger than an inner diameter of the frame at the fitted section, the difference between the inner diameter of the frame at the fitted section and an outer diameter of the sintered bearing being between 0 μm and 20 μm ;

(~~d~~) a cylindrical magnet fixed on an outer wall of said sintered bearing at an inner wall of said magnet; and

(~~e~~) a cylindrical coil facing said magnet via an annular space,

wherein said frame and said sintered bearing are welded at ~~a-the~~ fitted section ~~therebetween~~.

9. (Amended) An apparatus comprising:

(a) a housing; and

(b) a motor disposed in said housing, said motor including:

(b-1) a cylindrical frame made of ferromagnetic material;

(b-2) a pipe fitted in and disposed within said frame concentrically at a fitted section of the frame, an outer diameter of the pipe being larger than an inner diameter of the frame at the fitted section, the difference between ~~an-the~~ inner diameter of the frame at the fitted section and ~~an-the~~ outer diameter of the pipe is between 0 μ m and 20 μ m;

(b-3) a sintered bearing press-fitted into said pipe;

(b-4) a cylindrical magnet fixed on an outer wall of said pipe at an inner wall of said magnet; and

(b-5) a cylindrical coil facing said magnet via an annular space,

wherein said frame and said pipe are welded at ~~a-the~~ fitted section ~~therebetween~~.

13. (Amended) An apparatus comprising:

(a) a housing;

(b) a motor disposed in said housing, said motor including:

(b-1) a cylindrical frame made of ferromagnetic material;

(b-2) a sintered bearing fitted in and disposed within said frame concentrically at a fitted section of the frame, an outer diameter of the sintered bearing being larger than an inner diameter of the frame at the fitted section, the difference between the inner diameter of the frame at the fitted section and an outer diameter of the sintered bearing being between 0 μ m and 20 μ m;

10 (b-3) a cylindrical magnet fixed on an outer wall of said sintered
11 bearing at an inner wall of said magnet; and

12 (b-4) a cylindrical coil facing said magnet via an annular space, and

13 (c) ~~a pipe fitted in and disposed within said frame concentrically, the~~
14 ~~difference between an inner diameter of the frame and an outer diameter of the pipe is~~
15 ~~between 0 μ m and 20 μ m,~~

16 wherein said frame and said sintered bearing are welded at ~~a the~~ fitted section
17 therebetween.

1 Claims 3, 7, 11, and 15 have been cancelled.